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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,554	11/26/2003	Russell Gaudiana	15626-006001 / KON-018	9727

26161 7590 05/27/2008
FISH & RICHARDSON PC
P.O. BOX 1022
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EXAMINER	
TRINH, THANH TRUC	
ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
05/27/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/723,554	GAUDIANA ET AL.	
	Examiner	Art Unit	
	THANH-TRUC TRINH	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12,14-18 and 23-80* is/are pending in the application.

4a) Of the above claim(s) *75-80* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12,14-18 and 23-74* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/1/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

1. Claims 1-12, 14-18, 23-42, 53-62 and 64-69 and are rejected under 35 U.S.C. 103(a) as being unpatentable over Scher et al. (US Patent 6878871) in view of Chirvase et al. (Journal of Applied Physics, Vol. 93, No. 6, 15 March 2003, pages 3376-3383). The subject matter relied upon below is supported by Scher et al's provisional application 60/421353 filed on 10/25/2002, and thus has a 102(e) date with respect to the instant claims.

Regarding claim 1, as seen in Figure 7, Scher et al. discloses a photovoltaic cell comprising a first electrode (704); a mesh electrode (706); and a photoactive layer (702) between the electrodes, wherein the photoactive layer (702 which is similar to

photoactive layer 102 as seen in Figures 1 and 4A) comprises an electron acceptor such as nanocrystals (104) and an electron donor material (106) such as conductive polymer P3HT. (See col. 14 lines 48-67; col. 32 lines 27-57; and col. 17 line 25-38).

However Scher et al. does not specifically teach using fullerene as an electron accepting material.

Chirvase et al. teaches a photovoltaic cell comprising two electrodes and an photoactive layer between the electrodes, wherein the photoactive layer is a mixture of fullerene and polymer P3HT with fullerene as an electron accepting material and P3HT as an electron donating material. (See abstract and section "Studies of ITO/PEDOT:PSS/P3HT:PCBM/Al solar cell" of Chirvase et al.).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Scher et al. by using fullerene as taught by Chirvase et al. in place of the nanocrystals for the electron acceptor material, because Chirvase et al. teaches the combination of conjugated polymer such as P3HT and fullerene would improve the efficiency of polymer solar cells (See 2nd paragraph of column 2 page 3376 of Chirvase et al.).

Regarding claims 2-4, 6-7 and 25, Scher et al. describes both electrodes (first and second electrodes, or anode and cathode) can be wire arrays, interspersed with complementary wires. (See col. 31 lines 20-36). Therefore, it is the Examiner's position that Scher et al. teaches both anode and cathode are mesh electrodes comprising wires and electrically conductive material.

Regarding claims 5 and 8, Scher et al. teaches the electrodes can be made of metal. (See col. 30 line 63 to col. 31 line 4; col. 32 lines 45-49).

Regarding claims 9-10, Scher et al. teaches the wire electrodes can be coated with blocking layers (See col. 31 lines 20-36). Scher et al. also teaches a material for electron blocking layer is polymer P3HT (See col. 22 lines 30-43). Therefore it is the Examner's position that Scher et al. teaches the wire electrodes comprises coating including electrically conductive material such as polymer.

Regarding claims 11-12, Scher et al. teaches the electrodes are overlapping arrays of wires or interspersed with complementary wires (See col. 31 lines 20-36). Therefore it is the Examiner's position that Scher et al. teaches woven mesh electrodes. It is also the Examiner's position that Scher et al's wire mesh electrode reads on the instant "expanded mesh" because the "expanded" does not impart a distinguishable physical limitation. For example, the metal material, the thickness, the opening size of the mesh, etc., of the instant expanded mesh electrode can be the same as in Scher et al. regardless of whether or not Scher et al's wire mesh electrode has been subjected to a product-by-process expanding step. In other words, any wire metallic mesh electrode is essentially the same as the instant expanded mesh electrode in the absence of a recitation of a distinguishing feature.

Regarding claim 14, Chirvase et al. teaches using a substituted fullerene for the electron acceptor material (See 2nd paragraph of section "Introduction" of Chirvase et al.)

Regarding claims 15-16, both Scher et al. and Chirvase et al. teach using electron donor polymer comprising poly(3-hexylthiophene). (See 2nd paragraph Of section “Introduction” of Chirvase et al., or col. 17 lines 26-38 of Scher et al.).

Regarding claims 17-18, Scher et al. teaches including a hole blocking layer between the photoactive layer and an electrode (or the first electrode - See col. 27 lines 41-49). The hole blocking layer comprises a metal oxide such as TiO_2 (See col. 22 lines 1-43).

Regarding claims 23-24, as seen in Figure 4A, Scher et al. teaches including a hole carrier layer (or electron blocking layer 410) between the photoactive layer (102) and an electrode (110), wherein the hole carrier layer comprises polythiophenes (See col. 22 lines 1-43). Scher et al. also teaches either electrodes can be mesh electrode. (See col. 31 lines 20-36). Therefore it is the Examiner's position that Scher et al. teaches that the hole carrier layer is between the first electrode and the photoactive layer since the position of the hole blocking and hole carrier depends on the position of the electron acceptor and electron donor in the photoactive layer.

Regarding claims 26-27, 32-33, 39, 53-54, 59-60 and 66, as seen in Figure 4A, Scher et al. discloses a photovoltaic cell comprising a first electrode (108); a second electrode (110); and a photoactive layer (102) between the electrodes, wherein the active layer (102 as seen in Figure 1) comprises an electron acceptor such as nanocrystals (104) and an electron donor material (106) such as conductive polymer P3HT; a hole blocking layer (420) between the first electrode (108) and the photoactive

layer (102); a hole carrier (or electron blocking layer 410) between second electrode (110) and the photoactive layer (102). (See col. 14 lines 48-67; col. 22 line 1 to col. 23 line 7; and col. 17 line 25-38). Scher et al. also teaches that both electrodes can be formed by overlapping arrays of wires (See col. 31 lines 20-36), or wire mesh. Therefore it is the Examiner's position that the first and second electrodes can be wire mesh electrodes, the first mesh electrode (second electrode 110) is in contact with the hole carrier, and the second mesh electrode (first electrode 108) is in contact with the hole blocking layer.

However Scher et al. does not specifically teach using fullerene as an electron accepting material.

Chirvase et al. teaches a photovoltaic cell comprising two electrodes and an active layer between the electrode, wherein the active layer is a mixture of fullerene and polymer P3HT with fullerene as an electron accepting material and P3HT as an electron donating material. (See abstract and section "Studies of ITO/PEDOT:PSS/P3HT:PCBM/Al solar cell" of Chirvase et al.).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Scher et al. by using fullerene as taught by Chirvase et al. in place of the nanocrystals for the electron accepting material, because Chirvase et al. teaches the combination of conjugated polymer such as P3HT and fullerene would improve the efficiency of polymer solar cells (See 2nd paragraph of column 2 page 3376 of Chirvase et al.).

Regarding claims 28, 34, 55 and 61, Scher et al. teaches the electrodes can be made of metal. (See col. 30 line 63-col. 31 line 4; col. 32 lines 45-49.

Regarding claims 29-31 and 56-58, Scher et al. teaches the hole carrier (or electron blocking layer) comprising polythiophenes, and hole blocking layer comprising TiO_2 (or metal oxide). (See col. 22 lines 1-43).

Regarding claims 35-36 and 62, Scher et al. teaches the wire electrodes can be coated with blocking layers, electron blocking (or hole carrier) and hole blocking layer. (See col. 31 lines 20-36). Scher et al. also teaches a material for electron blocking (or hole carrier) layer is polymer P3HT (See col. 22 lines 30-43). Therefore it is the Examiner's position that Scher et al. teaches the wire mesh electrodes comprise coating including electrically conductive material, wherein the wire mesh electrode in contact with the hole carrier is coated with hole carrier material such as polymer.

Regarding claims 37-38 and 64-65, Scher et al. teaches the electrodes are overlapping arrays of wires or interspersed with complementary wires (See col. 31 lines 20-36). Therefore it is the Examiner's position that Scher et al. teaches woven mesh electrodes. It is also the Examiner's position that Scher et al's wire mesh electrode reads on the instant "expanded mesh" because the "expanded" does not impart a distinguishable physical limitation. For example, the metal material, the thickness, the opening size of the mesh, etc., of the instant expanded mesh electrode can be the same as in Scher et al. regardless of whether or not Scher et al's wire mesh electrode has been subjected to a product-by-process expanding step. In other words, any wire

metallic mesh electrode is essentially the same as the instant expanded mesh electrode in the absence of a recitation of a distinguishing feature.

Regarding claims 40 and 67, as seen in Figure 7, Scher et al. teaches a substrate (710) supporting the mesh electrode (706).

Regarding claims 41 and 68, Scher et al. describe depositing PEDOT-PSS onto the substrate before depositing nanocyrstal blend solution with one ingredient is a hole carrier material. (See Examples 1 and 2). Therefore, it is the position of the Examiner's that PEDOT:PSS is an adhesive material and being deposited between the substrate and the hole carrier.

Regarding claims 42 and 69, as seen in Figure 7, Scher et al. describes the photoactive layer (702) is in contact with the substrate (710) through openings (708). In addition, the photoactive layer comprises hole carrier (See col. 17 lines 39-50). Scher et al. also teaches the wire mesh electrode can be coated with hole carrier material. Therefore it is the Examiner's position that the hole carrier is in contact with the substrate supporting the mesh electrode on the hole carrier side through openings of the mesh electrode.

2. Claims 43-52 and 70-74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Scher et al. in view of Chirvase et al. and further in view of Chapin et al. (US Patent 2780765).

Scher et al. and Chirvase et al. teach a photovoltaic cell as described in claims 1, 26 and 53, wherein Scher et al. describes the output of the cell connected to a load (See Figure 1 of Scher et al.).

Neither Scher et al nor Chirvase et al. specifically teach electrically connecting the cells in series or in parallel.

Chapin et al. teach connecting the photovoltaic cells in series and parallel. (See col. 4 lines 45-74).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to connect the photovoltaic cells of Scher et al. and Chirvase et al. in either series or parallel as taught by Chapin et al, because Chapin et al. teaches connecting photovoltaic cells in series or in parallel would give a large voltage or a large current, respectively, according to the desired output. (See col. 4 lines 48-50 of Chapin et al.).

3. Claims 63 is rejected under 35 U.S.C. 103(a) as being unpatentable over Scher et al. in view of Chirvase et al. and further in view of Griffin (US Patent 3442007).

Scher et al. and Chirvase et al. teach a photovoltaic cell as described in claim 53.

Neither Scher et al. nor Chirvase et al. teaches coating wire mesh electrode in contact with the hole blocking with metals, alloys, polymers and combinations thereof.

Griffin et al. teach coating a wire mesh with electrically conductive material such as gold, copper or nickel. (See col. 2 lines 63-72).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the photovoltaic cell of Scher et al. and Chirvase et al. by coating the wire mesh with metal as taught by Griffin et al. before optionally coating with hole blocking material, because Griffin et al. teach coating the wire with metals such as gold, copper or nickel would provide an effective adhesion and good power efficiency. (See col. 2 lines 62 to col. 3 line 4 of Griffin et al.)

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-12 and 14- 18 and 23-74 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-39 of copending Application No. 11/033217 in view of Scher et al. (US Patent 6878871).

The subject matters of the claims of copending Application No. 11/033217 are substantially the same as that of the instant claims, except for the manner in which the electrodes are in the shape of a mesh, a hole blocking layer, a hole carrier layer. It would have been obvious to one having ordinary skill in the art to modify the cell of claims 1-39 of copending Application No. 11/033217 by utilizing the materials as taught Scher et al., because it would provide a desired overall device property. (See col. 4 lines 56-58).

This is a provisional obviousness-type double patenting rejection.

Response to Arguments

Applicant's arguments filed 2/19/2008 have been fully considered but they are not persuasive.

Applicant argues that the rejection under 103 over Scher in view of Chirvase is improper because Chirvase teaches the P3HT-fullerene photovoltaic cell having only 0.2% efficiency while Scher develops photovoltaic cells having an efficiency of about 10% . However, Applicant's argument is irrelevant. First of all, there is nothing in the claim about efficiency. Secondly, Chirvase teaches a great motivation that “conjugated polymer-fullerene (donor-acceptor) networks, also referred to as bulk heterojunctions, are a very promising approach for the improvement of efficiency of polymer solar cells” in second paragraph of second column of page 3376. Chirvase also concludes that the poor efficiency in the test solar cell can be improve by a need for a homogeneous mixture of a donor and acceptor to ensure sufficient electronic overlap between

molecules the blend such as an optimization of the mixture ratio and a junction formation procedures that should eliminate any possibility of contact with oxygen or other contamination (See the conclusions of Chirvase). Therefore, the poor efficiency shown in the test result of Chirvase is not because of the photoactive material of P3HT-fullerene, but because of other factors such as contamination or mixture ratio.

Applicant also argues that the combination of Scher in view of Chirvase is improper because Scher teaches two inorganic material exhibit a type II band offset energy profile; and that Scher uses inorganic semiconductor materials in the photoactive layer to absorb light and generate excitons which is in contrast with "P3HT-fullerene photovoltaic cell described in Chirvase, because fullerene has only weak visible light absorption while P3HT absorbs visible light that generates excitons. See, E.g., Chirvase, page 3377, left column, 1st paragraph and Fig.1." Again, Applicant's argument is deemed to be irrelevant. "Two inorganic material" is not the part of Scher's invention that the Examiner cited in the rejection above. As seen in Figures 1 and 4A, Scher teaches a photoactive layer comprising an electron acceptor material (106) and electron donor material (or hole transporting material) such as polymer P3HT (See col. 14 lines 48-67 and col. 17 lines 25-38). "A type II band offset energy profile" is a specific definition used by Scher to describe the electron and hole conductivities of a charge separation within a photoactive region of photovoltaic application. In general, any material in a photoactive regions of a photovoltaic application (creating voltage from light) has "a type II band offset energy profile" which includes the polymer matrix (See col. 14 lines 48-68). Otherwise, a non-photovoltaic application (such as LEDs which has

charge recombination) will have a "type I band offset energy profile" (See col. 7 lines 8-12). There is nothing in Scher describing only "the inorganic semiconductor materials in the photoactive layer to absorb light and generate excitons" or in Chirvase describing "fullerene has only weak visible light absorption, while P3HT absorbs visible light that generates excitons". As a matter of fact, Scher describes the light absorption and generation of excitons is in the photoactive region, more specifically at the junction of two different materials of different conductivities (hole conducting and electron conducting) in Figure 1 and co. 14 lines 59-63 of Scher). Chirvase describes the process of charge separation occur in the photoactive region or polymer/fullerene composite in page 3377, left column, 1st paragraph (Note: PCBM is a form of fullerene). Since Chirvase teaches the presence of strong (electron) acceptor species such as fullerene (C_{60}) would enhance the carrier generation yield (See the last line of column 2 page 3376 bridging the first line of column 1 page 3377), it would have been obvious to one skilled in the art to use fullerene as an electron acceptor (or electron conducting) material in the device of Scher. In addition, a selection of a known material based on its suitability for its intended used does support a *prima facie* obviousness determination. See MPEP 2144.07.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thanh-Truc Trinh whose telephone number is 571-272-6594. The examiner can normally be reached on 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 571-272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Thanh-Truc Trinh/
Examiner, Art Unit 1795
5/16/2008

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795